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### REMARKS

Entry of this Amendment is proper because it narrows the issues on appeal and does not require further search by the Examiner.

Claims 1-14 and 24-31, 33-34, 36-37 and 39 are all the claims presently pending in the application. Claims 32, 35 and 38 have been canceled. Claims 1, 5-7, 10, 24-25, 34 and 37 have been amended to more particularly define the invention.

It is noted that the claim amendments are made only for more particularly defining the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that the amendment to any claim herein should be construed as a disclaimer of any interest in the right to an equivalent of any element or feature of the amended claim.

Claims 24 and 25 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Chon et al. "Fatigue free samarium-modified bismuth titanate film capacitors having a large spontaneous polarizations". Claims 1-3, 5-8, 10, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Haukka et al. (U.S. Patent No. 2002/0115252). Claims 4, 9, 14 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Haukka et al. Claims 11, 12, and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Haukka et al. Claims 31-39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Haukka et al. in view of Chon et al.

These rejections are respectfully traversed in the following discussion.

#### **I. THE CLAIMED INVENTION**

The claimed invention is directed to a data storage element which includes a substrate including a semiconductor material, a metal oxide layer including an electrically insulating rare earth metal oxide disposed upon a surface of the substrate, the metal oxide layer forming a predetermined current-voltage profile under an applied voltage and forming an anode element of the data storage element, a conductive material disposed upon the metal oxide layer, a first electrode electrically connected to the conductive material, and a second electrode electrically connected to

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the substrate, to form the data storage element.

Conventional data storage elements use metal films for accumulating charge (e.g., as an active element). However, such devices have high charging voltage requirements and the charge retention times are short (Application at page 1, line 10-page 2, line 5).

The claimed invention, on the other hand, includes a metal oxide layer including an electrically insulating rare earth metal oxide disposed upon a surface of the substrate, the metal oxide layer having a predetermined current-voltage profile under an applied voltage and forming an active element of the data storage element (Application at Figures 4-5). This provides the claimed data storage element to provide a low charging voltage requirement and a long charge retention time (Application at page 11, lines 5-14).

## II. THE PRIOR ART REFERENCE

### A. The Chon, et al. Reference

The Examiner alleges that Chon teaches the claimed invention of claims 1-5. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Chon.

Chon discloses a  $\text{Bi}_{3.15}\text{Sm}_{0.85}\text{Ti}_3\text{O}_{12}$  (BSmT) thin film grown on Pt/TiO<sub>2</sub>/Si (100) substrates using the method of metalorganic sol decomposition. In addition, Chon discloses a BsmT capacitor allegedly showing good charge-retention characteristics (Chon, Abstract).

However, Chon does not teach or suggest "a metal oxide layer comprising an electrically insulating rare earth metal oxide disposed upon a surface of said substrate, said metal oxide layer comprising a predetermined current-voltage profile under an applied voltage and forming an active element of said data storage element", as recited, for example, in claim 1.

As noted above, unlike conventional data storage elements which use metal films for accumulating charge (e.g., as an active element), the claimed invention, includes a metal oxide layer which includes an electrically insulating rare earth metal oxide disposed upon a surface of

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the substrate, and having a predetermined current-voltage profile under an applied voltage and forming an active element of the data storage element (Application at Figure 1). This allows the claimed data storage element to provide a low charging voltage requirement and a low charge retention time (Application at page 11, lines 5-14).

For example, in one particular embodiment, the metal oxide layer may be formed on a substrate and an electrode formed on the metal oxide layer (e.g., see Application at Figure 1). Specifically, in this embodiment, when a voltage is applied between the first and second electrodes, beyond a threshold voltage, charge is accumulated in the metal oxide layer, thereby shifting current-voltage and capacitance-voltage characteristics, and upon reversal of the applied voltage, beyond a threshold voltage, the charge in the metal oxide layer is discharged, thereby restoring original current-voltage and capacitance-voltage requirements (Application at page 11, lines 5-14).

More specifically, the metal oxide layer of the claimed invention has a predetermined current-voltage profile under an applied voltage (Application at Figures 4-5; page 9, line 23). This allows the claimed device to be used as a memory device.

Clearly, these novel features are not taught or suggested by Chon. Indeed, the Examiner has not even alleged that Chon taught or suggested this feature.

In fact, Chon merely discloses a BSmt film which forms a dielectric layer and a capacitor (e.g., see Chon at Figure 2). However, nowhere does Chon teach or suggest the metal oxide layer of the claimed invention, which has a predetermined current-voltage profile under an applied voltage, and which forms an active element of a data storage element.

Therefore, Applicant submits that there are elements of the claimed invention that are not taught or suggested by Chon. Therefore, the Examiner is respectfully requested to withdraw this rejection.

#### **B. The Haukka, et al. Reference**

The Examiner alleges that Haukka makes obvious the invention of claim 1 and 28-30. In addition, the Examiner alleges that Haukka would have been combined with Chon to

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form the claimed invention of claims 31-39. Applicant submits, however, that the references would not have been combined and even if combined, the combination would not suggest each and every element of the claimed invention.

Haukka discloses aluminum oxide and lanthanide layers, particularly formed by an atomic layer deposition (ALD) type process, which serve as interface layers between two or more materials. The interface layers are intended to prevent oxidation of a substrate and prevent diffusion of molecules between the materials (Haukka at Abstract).

However, Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems and solutions.

Specifically, Chon is directed to BSMT film for a capacitor, whereas Haukka is merely directed to dielectric interface (e.g., aluminum oxide) films. Therefore, these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, contrary to the Examiner's allegations, neither of these references teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Haukka, nor Chon, nor any combination thereof teaches or suggests "a metal oxide layer comprising an electrically insulating rare earth metal oxide disposed upon a surface of said substrate, said metal oxide layer comprising a predetermined current-voltage profile under an applied voltage and forming an active element of said data storage element", as recited, for example, in claim 1.

As noted above, unlike conventional data storage elements which use metal oxides for accumulating charge (e.g., as an active element), the claimed invention, includes metal oxide layer which includes an electrically insulating rare earth metal oxide disposed upon a surface of

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the substrate, and having a predetermined current-voltage profile under an applied voltage and forming an active element of the data storage element (Application at Figure 1). This allows the claimed data storage element to provide a low charging voltage requirement and a long charge retention time (Application at page 11, lines 5-14).

Specifically, the metal oxide layer of the claimed invention has a predetermined current-voltage profile under an applied voltage (Application at Figures 4-5; page 8, line 9, line 23). This allows the claimed device to be used as a memory device.

Clearly, these novel features are not taught or suggested by Haukka. Indeed, Haukka merely discloses high-k dielectric films. That is, nowhere does Haukka teach or suggest the metal oxide layer of the claimed device.

Specifically, Haukka may disclose an aluminum oxide or a lanthanide oxide layer (e.g., Haukka at Figure 4; paragraph [0060]). However, nowhere does Haukka teach or suggest a metal oxide layer which forms an active layer in a data storage element. Indeed, nowhere does Haukka teach or suggest a metal oxide layer formed on a substrate, and having a predetermined current-voltage profile under an applied voltage. Therefore, Haukka does not make up for the deficiencies of Chon.

As noted above, Chon does not teach or suggest these features. Therefore, Chon clearly does not make up for the deficiencies of Haukka.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw the rejection.

#### IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-14 and 24-31, 33-36-37 and 39, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the

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Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 12/31/03

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**CERTIFICATE OF FACSIMILE TRANSMISSION**

I hereby certify that the foregoing Amendment was filed by facsimile with the United States Patent and Trademark Office, Examiner Bradley Smith, Group Art Unit # [redacted] at fax number (703) 872-9306 this 31<sup>st</sup> day of December, 2003.



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